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March 5, 1993

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
Washington, D.C. 20554

Re: Notice of Ex Parte Contact
ET Docket No. 92-9

Dear Ms. Searcy:

Western Tele-Communications, Inc. (WTCI), by its undersigned counsel, pursuant to Section 1.1206 of the Commission's Rules, hereby files an original and one copy of a notification of an ex parte contact in ET Docket No. 92-9 in the form of its Supplemental Comments with reference to the Further Notice of Proposed Rule Making, released September 4, 1992.

On this date, copies of WTCI's Supplemental Comments were distributed to Chairman James H. Quello, Commissioner Sherrie P. Marshall, Commissioner Andrew C. Barrett and Commissioner Ervin S. Duggan, Dr. Thomas P. Stanley, Damon C. Ladson, Paul Marrangoni, Tom Mooring, Cheryl A. Tritt, Thomas S. Tycz, Robert James and Ralph A. Haller.

Should any questions arise concerning this notification, please communicate with the undersigned.

Sincerely yours,

Richard H. Strodel
Counsel for Western Tele-Communications, Inc.

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Enclosures

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Before The

Federal Communications Commission

Washington, D.C. 20554

In The Matter Of	)	
	)	
Redevelopment Spectrum to	)	ET Docket No. 92-9
Encourage Innovation in the	)	
Use of New Telecommunications	)	RM-7981
Technologies	)	RM-8004

Supplemental Comments of Western Tele-Communications, Inc.

Western Tele-Communications, Inc. (WTCI), by its attorneys, hereby submits these Supplemental Comments with respect to the Commission's Further Notice of Proposed Rule Making (Further Notice), released September 4, 1992 in the above captioned proceeding. WTCI previously filed Comments on December 11, 1992 and Reply Comments on January 27, 1993.

I. Executive Summary

WTCI is filing these Supplemental Comments as a follow-up to its meetings with the Office of Engineering and Technology and the Common Carrier Bureau on February 10, 1993.[1] These Supplemental Comments further support the points and recommendations advanced in WTCI's Reply Comments, and supplement, through the indicated subheadings and following materials, the following three pivotal recommendations:

[1] WTCI filed ex parte notification of these meetings on February 11, 1993.

1. The 1.71-1.85 GHz government band should be the primary frequency band for displaced 2 GHz users.

   a. Use this government band generally for modifications of existing 2 GHz systems only.

   b. Provide for PCS users to reimburse government agencies for upgrading their facilities to permit additional 2 GHz usage.

2. WTCI's order of frequency priority for displaced 2 GHz users is based on the reality of available frequencies.

   a. Frequency congestion in the 4, 6 and 11 GHz common carrier bands and the co-location of common carrier and private facilities severely restrict the ability of 2 GHz users to migrate to such common carrier bands. (E.g., see frequency use overlays for Denver, CO, Seattle, WA and Jump Off Joe Butte (Tri-Cities), WA.)

   b. The relocation costs of moving 2 GHz users into the 4, 6 and 11 GHz common carrier bands is prohibitive and a deterrent to PCS development.

3. The existing, industry-wide frequency plans in the 4, 6 and 11 GHz common carrier bands should be retained and incorporated in Part 21 of the Rules.

   a. Retuning existing common carrier systems to new frequency plans is completely impractical and may be unworkable.

   b. Growth channels and spurs to new points must be on same frequency plan as existing system.

   c. 6 GHz - Existing plan - 29.65 MHz spacing (Narrow bands - Restrict power or use 1.25 MHz channels at 5 MHz band edges and 1.25 MHz at 15 MHz midband).

11 GHz (last used) Existing DE/JP plan
(Narrow bands - Use AT&T plan).
4 GHz (unworkable - C-band downlinks)
(If allocated, use ABCD interleaved plan and add 40 MHz channels).

II. The 1.71 - 1.85 GHz Government Band Should be the Primary Frequency Band for Displaced 2 GHz Users

As pointed out in WTCI's Reply Comments (see particularly pp. 11 through 14), the 1.71 - 1.85 GHz government band is especially suited for 2 GHz users because this band is less congested than the 4, 6 and 11 GHz common carrier bands and equally important, the cost of relocation would be relatively small compared to the cost of relocating above 3 GHz. (See also Summary, p. ii; Introduction, pp. 2-4). The 2 GHz government band is the best band for 2 GHz users since the great majority of 2 GHz systems could simply be retuned to the nearby frequencies and the system operating characteristics (e.g. tower and antenna specifications and beam width tolerances) would remain the same, all resulting in far lower transition costs.

WTCI's recommendations in this area are based on the assumption that most 2 GHz users could merely modify their existing facilities and would not be required to build new facilities. Further refining its recommendation, WTCI proposes that the Commission provide that generally, or with limited exceptions or waivers, the displaced 2 GHz users would be permitted to modify their existing facilities only, and would not be permitted to construct new facilities in the 2 GHz government band. If this approach is followed, the displaced 2 GHz

users could amortize fully their equipment by using the government band and ultimately would be expected to move to different bands or alternative means of communication such as fiber or other systems when the useful life of 2 GHz equipment (normally 10 years) is reached.[2] This would enable these 1.71 - 1.85 GHz frequency bands to be available in the future for mobile uses, PCS or others, if needed.[3]

Finally, WTCI recommends that, where 2 GHz users are modifying their facilities to move to the 1.71 - 1.85 GHz government band, those paying for the cost of this migration to the government band should reimburse government agencies that may be required to change or upgrade their facilities to permit such migration. Since frequency congestion is not as great in this government band, many of the government facilities have not been constructed to as tight engineering specifications as common carrier systems. Thus, improvements to existing government facilities in the band, which otherwise may not be practical because of funding problems and delays occasioned thereby, could be readily accomplished and would result in considerable additional frequency spectrum for displaced 2 GHz users.

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[2] For example, at the FCC's March 1, 1993, hearing in Docket No. 92-235, representatives of state and local governments testified they try to adhere to 10 year replacement cycles for telecommunications equipment. Thus, 2 GHz users moving into the government band through modification of their existing systems would gradually vacate that band.

[3] NTIA similarly and for the same reason should proscribe the construction of new point-to-point microwave facilities by government agencies in the 2 GHz frequency band.

III. WTCI's Order of Frequency Priority for Displaced 2 GHz Users is Based on the Reality of Available Frequencies

WTCI stressed in its Reply Comments that common carrier use of point-to-point microwave facilities in the 4, 6 and 11 GHz bands is not decreasing (Reply Comments, pp. 5-7). As stated and as an underlying premise of WTCI's recommendations for the order of priority for frequency usage by displaced 2 GHz users, the 4, 6 and 11 GHz common carrier bands are heavily used, particularly in metropolitan areas, and in many cases there is little or no room for new usage by former 2 GHz users. Additionally, in many cases both in rural or semi-rural areas and in urban areas, 2 GHz users are co-located with common carrier users at antenna farms, or designated antenna sites on government lands, and these 2 GHz users may well be required to find new sites in order to migrate to common carrier frequencies.[4]

Attached hereto are two typical frequency overlays of 4, 6 and 11 GHz common carrier band frequency usage in metropolitan areas. The first overlay shows very heavy frequency usage in the Seattle - Tacoma area, and most of these routes are heavily loaded, with little additional channel capacity. The second overlay of a metropolitan area shows common carrier frequency usage in the Denver area. This overlay shows considerable congestion and the routes are also generally heavily loaded.

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[4] The one exception is the common carrier LTL band between 6425 - 6525 MHz. This band is now little used because broadcasters now rely primarily on remote satellite transportable units and the Electronic News Gathering band for their remote broadcasts. See Supplemental Engineering Statement, p.1. WTCI therefore recommends in its order of priority for frequency usage that this LTL band be used before the 4, 6 and 11 GHz point-to-point microwave service bands. See p. 10, infra.

The third overlay shows common carrier of frequency usage at an important antenna location at Jump Off Joe Butte, Washington, which is in the Tri-City area of Richland, Pasco and Kennewick, Washington and the Hanford Atomic Energy Reservation. There are a number of 2 GHz users at the Jump Off Joe Butte site. WTCI, which has considerable facilities at the site, attempted to supplement its facilities by engineering a new route through this site. However, this proved to be impossible and would require four or five additional hops around the site; accordingly, the route has not yet been built. Thus, 2 GHz users proposing to change to common carrier frequencies at this site undoubtedly would be unable to find frequencies and would be required to engineer around the site by constructing a number of additional sites.[5]

Due in part to the heavy use of common carrier frequencies in the 4, 6 and 11 GHz bands, the cost of moving displaced 2 GHz users into these bands is extremely high. As shown by WTCI's Engineering Statement, Appendix B, attached to its Reply Comments, the typical cost of moving a station from the 2 GHz band to the common carrier bands is $125,000, and this is in the lower range of possible costs. Because of tighter coordination specifications, the cost of two antennas alone range from $25,000 to $40,000, and if space diversity is required because of the higher bands and reliability needs of displaced 2 GHz users, the antenna costs would be twice as high. If higher towers are required for space diversity or other reasons, the $15,000 tower cost shown in Appendix B could be increased to as high as $100,000. Thus the cost of

[5] WTCI has multiple facilities in both the Denver, Seattle and Jump Off Joe Butte areas. These overlays are based on frequency compilations in WTCI's data base which is used in preparing applications for additional or new services. This data base is coordinated with and confirmed by the data base of Comsearch.

relocation in many instances, even assuming the existing site can be used, could well be in the higher range of $190,000 to $240,000. See Supplemental Engineer Statement, Exhibit A.

As shown by the frequency overlay maps mentioned above and the attached Engineering Statement, there are many instances where 2 GHz users would not be able to use common carrier frequencies and also remain at the existing site. The additional cost of developing a new site would be in the range of $75,000. See Supplemental Engineering Statement, Exhibit A. As shown there, the inability to use an existing site may require the construction of as many as three (or more) additional sites to engineer around the frequency congestion. Thus, the cost of relocating to new sites would range from $200,000 to $500,000 or $600,000, per site. Thus, the total cost of moving all displaced 2 GHz users into the upper bands may far exceed the Commission estimate of $2.75 billion, and would exceed the $3.75 billion estimate recited in WTCI's Reply Comments, p.8.

IV. The Existing, Industry-Wide Frequency Plans in the 6 and 11 Common Carrier Bands Should be Retained and Incorporated in Part 21 of the Rules

WTCI stressed in its Reply Comments, as have other carriers participating in the proceeding, that the frequency plans proposed in the Further Notice for the common carrier bands were generally unworkable and were in all cases extremely costly and difficult to implement, and that the existing, industry-wide frequency plans should be retained and incorporated in the revised Part 21 Rules, along with narrow band

channelization provisions that do not inhibit the growth and efficient use of the common carrier bands. See Reply Comments, pp. 18-20, 9-10 and Summary, p. 1. WTCI has estimated that its cost of changing to the proposed frequency plans would be a minimum of $25,000,000 and the cost to the entire industry with its 15,000 microwave sites would be $1,275,000,000 over the period of the changeover. See Reply Comments, Engineering Statement (pp. 2-3), Appendix A. The operating problems caused by the changeover to the proposed plans are equally daunting.

The retuning of existing systems to new frequency plans would be extremely complex and costly and would require extraordinary efforts to avoid interruptions in service to the public. All carriers in the coordinating radius of the system would have to take into account the retuning and probably do their own retuning at the same time, further complicating the retuning to new frequency plans. See WTCI's Supplemental Engineering Statement for further details.

In the Engineering Statement attached to its Reply Comments, WTCI pointed out that it was not feasible to mix frequency plans on a microwave system, i.e. adding growth channels or spur channels to new points on one frequency plan to a system on another frequency plan. While the Engineering Statement stated that there would be severe intrasystem interference in such cases, the attached Supplemental Engineering Statement sets forth in engineering terms the extent of that interference.

WTCI strongly urges the Commission to adopt the existing 6 GHz frequency plan with its 29.65 MHz spacing and the existing 11 GHz DE/JP Plan. In addition to the positions and recommendations in its Reply Comments, WTCI is proposing here that narrow band

transmissions in the 6 GHz common carrier band be limited in power to avoid the coordination and other problems resulting from concentrated power in narrow frequency spectrum. See Supplemental Engineering Statement, Exhibit A, p. 2.

WTCI does not believe it is feasible to use the 4 GHz band for displaced 2 GHz users primarily because of the potential interference to C Band satellite systems and downlinks. If the Commission nonetheless concludes that 4 GHz band should be made available to displaced users, WTCI recommends that the existing ABCD interleaved frequency plan be formally adopted by the Commission for all users of this band. See Supplemental Engineering Statement for additional reasons for using this plan.

V. Conclusion

The Commission should press forward vigorously with its discussions with NTIA to enable 2 GHz users to migrate to the 1.71 - 1.85 GHz government bands by modifying (retuning, etc.) their existing facilities. This movement to the government band would permit existing systems and equipment to be amortized over their useful life, thereby lowering dramatically the cost to PCS users and promoting PCS development.

WTCI reiterates its recommendation that the Commission set on order of priority for frequency band usage by those moving from the 2 GHz band, as follows:

1. Use the 1.71-1.85 GHz band, supplemented where necessary by the 10.550-10.680 GHz band for short hauls and 6.525-6.875 for long hauls;

2. Use the 1.71-1.85 GHz band, supplemented where necessary by the edge bands of the 6 GHz common carrier band, with channels of 400 kHz or smaller;

3. Use the 3.6-3.7 GHz band;

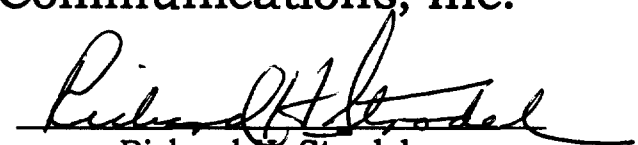
4. Use the 6425-6525 LTL band;

5. As a last resort only, migrate the displaced 2 GHz users into the 6 and 11 GHz bands, using the channelization plan proposed by AT&T.

This requirement for step by step migration - not allowing the next frequency band to be used unless the preceding bands are unavailable - will provide more than adequate frequency spectrum for displaced 2 GHz users and also will reduce greatly the problems and frustrations that would result from the undisciplined co-primary use proposed by the Further Notice. Finally, WTCI recommends, and strongly supports the recommendations of AT&T, MCI and many other commenters, that the existing industry-wide 4, 6 and 11 GHz common carrier frequency plans be retained and those in Appendix A to the Further Notice be rejected.

Respectfully submitted,

Western Tele-
Communications, Inc.



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March 5, 1993

SUPPLEMENTAL ENGINEERING STATEMENT
BY RUSSELL F. JOHNSON
ENGINEERING CONSULTANT TO WTCI

1.71 - 1.85 GOVERNMENT BAND

The shared use of the 1.71 GHz to 1.85 GHz government band by those moving from the 2 GHz band is the most practical, cost effective solution to the need to provide frequency spectrum for emerging technologies.

The government users are primarily in rural areas, while the major thrust of PCS for the initial eight to ten years will be in metropolitan areas. Since this co-primary use might well require modification of government facilities to increase spectrum availability, the PCS users should bear the cost of upgrades for the government users as well as the private users.

The advantages to this approach are:

1. Simple re-tuning at low cost with off the shelf hardware.
2. Permits normal amortization of equipment -- ten years or more.

All new applications for service initially would be restricted to the LTL and operational fixed bands in the 6 GHz bands. It is recommended that NTIA also prohibit new fixed services in the 1.71 GHz to 1.85 GHz band. With proper planning between the FCC and NTIA and adoption of standardized coordination criteria, this is a workable solution.

6425-6525 BAND AVAILABILITY

The 6425-6525 frequency (LTL) band was first assigned to broadcasters for the use of connecting their remote broadcasts to the studio via terrestrial microwave. This was a crowded band until the advent of the remote satellite transportable units and the Electronic News Gathering band. Most of the broadcasters have gone to these sources of communication and the LTL band is used very little, and in some cases not at all. WTCI therefore believes there is 100 MHz of spectrum that is available for use for the displaced 2 GHz users.

Accordingly, the Commission should provide that this 6425-6525 frequency band is to be made available for co-primary general use by displaced 2 GHz users and common carriers. This additional 100 MHz of spectrum should be used by former 2 GHz users, as available, before the 6 GHz common carrier band.

FREQUENCY RETUNE

To add a new frequency plan to an existing frequency plan in the same band becomes a retuning nightmare to say the least. At 6 GHz, as are the majority of WTCI's routes, the retune would need to be completed on a complete path basis and in a switch section. Most carrier routes are full block operational, eight frequencies, and usually have eight or more paths in a switch section. The traffic would need to be completely rerouted to other routes or systems prior to even beginning the retune. Not only would the retune require the joint coordination effort of WTCI, but all carriers in the coordination radius would most likely need to retune their frequencies as the two frequency plans would no longer be compatible. The other carriers operating in the area would need to coordinate their effort to retune their frequencies and reroute their traffic. In addition, the cross polarization advantage will begin to disappear as you shift through the band. Another problem, especially at 11 GHz, would be replacement of bandpass filters. Most filters used in the WTCI system are of the 40 MHz variety and a 30 MHz filter would require a new filter along with a new IF section. The simultaneous retuning and traffic disruption would substantially increase WTCI's estimated minimal retune cost of $25,000,000.

FREQUENCY PLANS FOR SPURS, TRUNK ROUTES AND GROWTH CHANNELS

The existing 29.65 MHz TH 6 GHz and 40 MHz 11 GHz frequency plans currently in use require that these plans remain in tact to allow for the addition of growth channels and of spurs from existing trunk routes. The C/I matrix currently used in the 6 GHz frequency plan have separation objectives of 0 MHz, 7.5 MHz, 15 MHz, 22.5 MHz and 30 MHz, and the 11 GHz frequency plan have separation objectives of 0 MHz, 20 MHz and 40 MHz. These frequency plans work well with themselves; however, if a separate frequency plan is introduced, there will be resulting carrier beats that cannot be tolerated. The cross-pole advantage also will be lost as the frequency plans shift down through the spectrum.

Most spurs will require a discrimination angle of at least 45° as a minimum to coordinate with each other and the two or more paths must be cross-polarized. Discrimination angles of less than 45° use available main backbone frequencies which precludes full route growth. This is required since the C/I objective is 72dB for a co-channel digital case at 6 GHz and the C/I objective is 81dB for a co-channel digital case at 11 GHz. At 6 GHz, as you begin to roll through the frequency plan, you begin to shift away from the two frequency plans and an unwanted carrier beat will result. To correct this you

must either increase your discrimination angle or bring the two transmitters back to the same frequency.

This overall problem for adding growth channels or spurs is worse at 11 GHz since you will completely lose your cross polarization as you are shifting 10 MHz through the plan until you eventually are parallel polarized with the other path. A good example would be where the trunk path is operating on frequencies 10735V, 10775H, and 11015V, and the spur is operating on frequencies proposed by the new frequency plan of 10725H, 10755V, and 10785H. The frequencies 10725H and 10735V would be cross polarized with each other at 10 MHz but the frequencies 10735V and 10755V would be parallel polarized at 20 MHz with no cross polarization advantage. The only solution for spurs would be to open up the discrimination angle greatly. This would not be cost effective and might well be impossible because of terrain, site selection, coordination or other obstacles.

INTERFERENCE AND RELIABILITY

Interference and reliability are separate concepts and should not be used interchangeably or loosely as has been the case in discussions about comparisons between 2 GHz private systems and higher band common carrier systems. Since the 2 GHz band allows for wider tolerances, with greater possibilities for interfering with adjacent systems, the band's interference criteria is higher than the common carrier band where system tolerances are much tighter and system interference can be less stringent. But the key factor is not the interference criteria per se, but the reliability of the system in terms of the time duration of outages per operating year. Systems operating without space diversity, as most 2 GHz private systems do, cannot be as reliable as common carrier systems employing such diversity and/or frequency diversity (1 for N protection) and having down times of one or more seconds per year.

The common carrier C/I objectives are based on a one decibel degradation per switch section. The current C/I objectives used in the 4 GHz and 6 GHz bands for co-channel digital into digital is 72 dB. This number is derived from the sum of the following numbers: the digital radio will operate at a BER of 10-3 with a C/I of 26dB, plus 40dB of fade margin, plus 6dB of intra and inter system interference, for a total of 72dB. The same provisions are applied to the 11 GHz frequency band; however, an additional 10dB is added for rain attenuation for a total of 82dB. These C/I objectives have been employed since the digital radio was introduced and are and have been the accepted standard of the common carrier industry. Although these C/I numbers are not equal to the EIA/TIA TSB10-E numbers, common carrier radio systems have operated without carrier to interference being a problem with system reliability.

The concern expressed by the 2 GHz users that path reliability must be 100% appears to be contradicted by the fact that most 2 GHz links do not

incorporate space diversity. The median 2 GHz path outage without diversity has a calculated path outage budget in the range of 675 seconds per year. WTCI's typical 6 GHz path which utilizes space and frequency diversity has a calculated path outage budget which is in the range of two seconds per year.

4 GHz FREQUENCY PLAN

The 4 GHz frequency plan should not be used by the displaced 2 GHz frequency users due to the large amount of receive only earth stations currently in operation. It is estimated that there are from 3.9 to over 6 million receive only earth stations in operation, with several thousand more stations coming on line each month. With these large quantities of earth stations, the frequency coordination effort will be costly, timely and frustrating because of the high probability of interference to earth stations. The problem will be aggravated by the large proportion of unregistered/unlicensed earth stations.

The existing 4 GHz frequency plan as it exists today cannot incorporate the proposed Further Notice/Alcatel 4 GHz frequency plan for two reasons. First, the Alcatel frequency plan has re-arranged the existing 4 GHz frequency plan into a high/low frequency plan. This will not fit in with the existing plan due to frequency separation. The existing 4 GHz frequency plan utilizes the building of 40 MHz parallel polarized and 20 MHz cross-polarized frequencies. The Alcatel frequency plan will cause the frequencies to be cross-polarized at 40 MHz (which is alright), and be parallel polarized at 20 MHz (which is not acceptable due to the filtering characteristics of the radio). Second, the frequency plan will not fit in with existing frequency plans since the Alcatel plan will create what we call "bucking stations". These stations will look like mixed frequency plans to an existing system and will be a frequency coordination nightmare. These proposed frequency plans could be used on separately designed radio routes; however, when joined with an existing route or placed into an established metropolitan environment, they would need to be switched over to the existing plan which causes problems with the proposed route.

This Supplemental Engineering Statement and Exhibit A were prepared by me or under my supervision with the assistance of WTCI's in-house engineering staff.

Russell F. Johnson

March 3, 1993

EXHIBIT A

TYPICAL 2 GHz BAND MIGRATION COST ABOVE 3 GHz[1]

Radio Equipment		$ 76,800
Waveguide Components		$ 3,460
2 Antennas (Standard A)		$ 24,740
Frequency Coordination		$ 5,000
Tower Cost		$ 15,000
	TOTAL	$ 125,000

These costs represent relocation to the upper frequency bands only. Assumes existing station will frequency coordinate and will not require relocation. If the existing tower can be modified and not replaced, the overall cost of a tower study and the tower modification would approximate the cost of the assumed 35 foot new tower. The labor costs are not included in the respective items.

HIGHER RANGE 2 GHz BAND MIGRATION COST ABOVE 3 GHz.

Radio Equipment		$ 76,800
Waveguide Components		$ 3,460
2 Antennas (High Performance)		$ 40,000
Frequency Coordination		$ 5,000
Tower Cost		$ 50,000 - $100,000
	Total	$ 190,000 - $240,000

TYPICAL SITE RELOCATION COST

Site Development and Road	$ 20,000
Engineering and Land Acquisition	$ 20,000
New Building	$ 20,000
Power (AC and DC)	$ 15,000
	$ 75,000

[1] This cost table is the same as the table shown in Appendix B, Engineering Statement to WTCI's Reply Comments.

EXHIBIT A

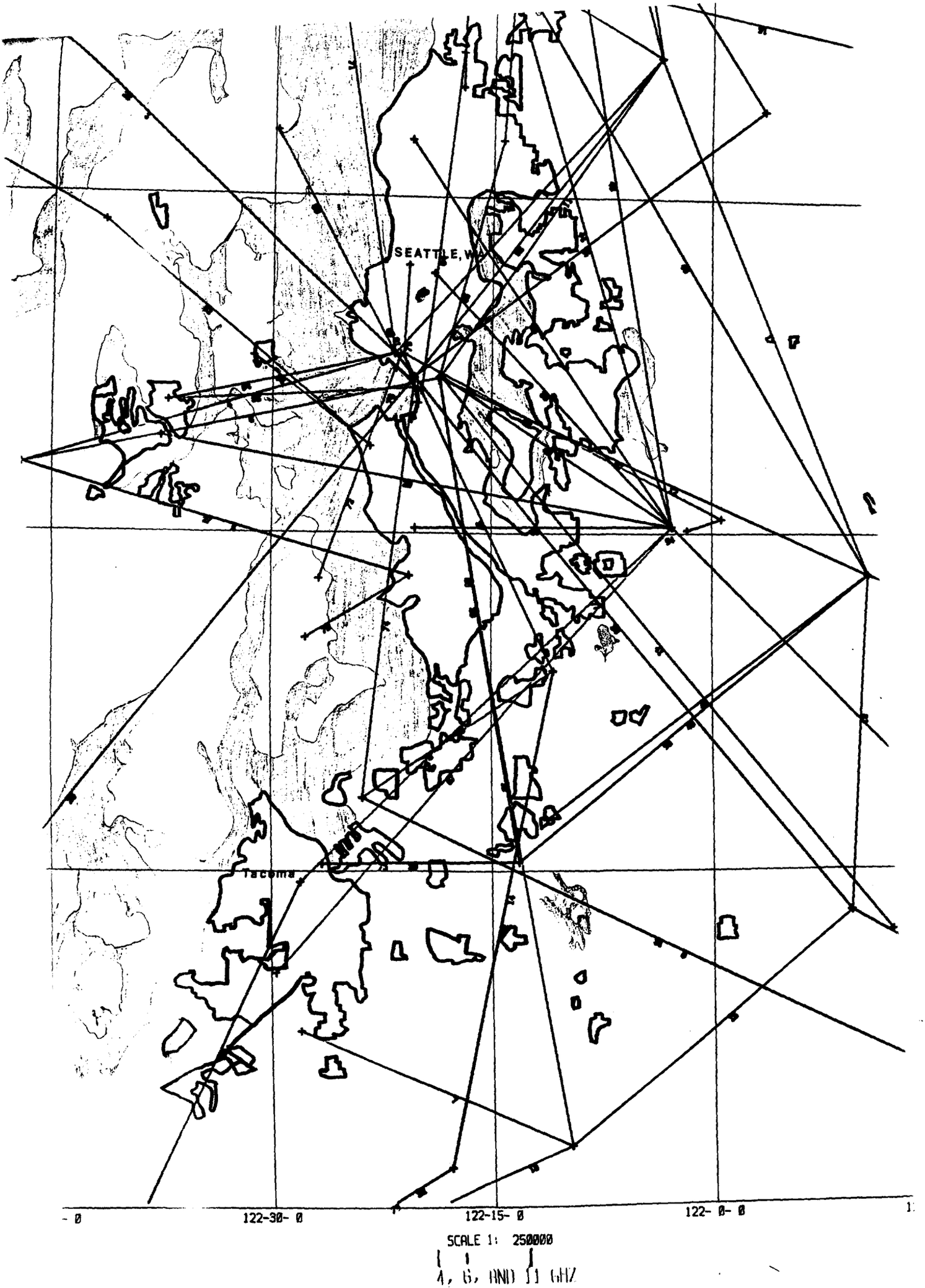
6 GHz PLAN - 1.25 MHz BASEBAND ASSIGNMENT

If the narrow band users desire to utilize the 400 KHz, 800 KHz, etc., bandwidth, then there must be a provision limiting the amount of power in these very narrow spectrums. No one should require one watt or up to five watts of power for such a narrow band of energy. This will cause all the power to be concentrated into the narrow spectrum as compared to a wideband user such as a 2400 channel analog system, a 5 MHz video system or a 135 MBS digital system which has its power spread throughout the spectrum but at the same amount of power.

If the above narrow bands are not limited in power output, then WTCI recommends that the 1.25 MHz frequency spectrum as stated in the Harris/Farinon comments be used, as the power can be spread over a greater amount of bandwidth. This would permit the use of 1.25 MHz channels at the 5 MHz band edge frequencies and at the 15 MHz midband frequencies.

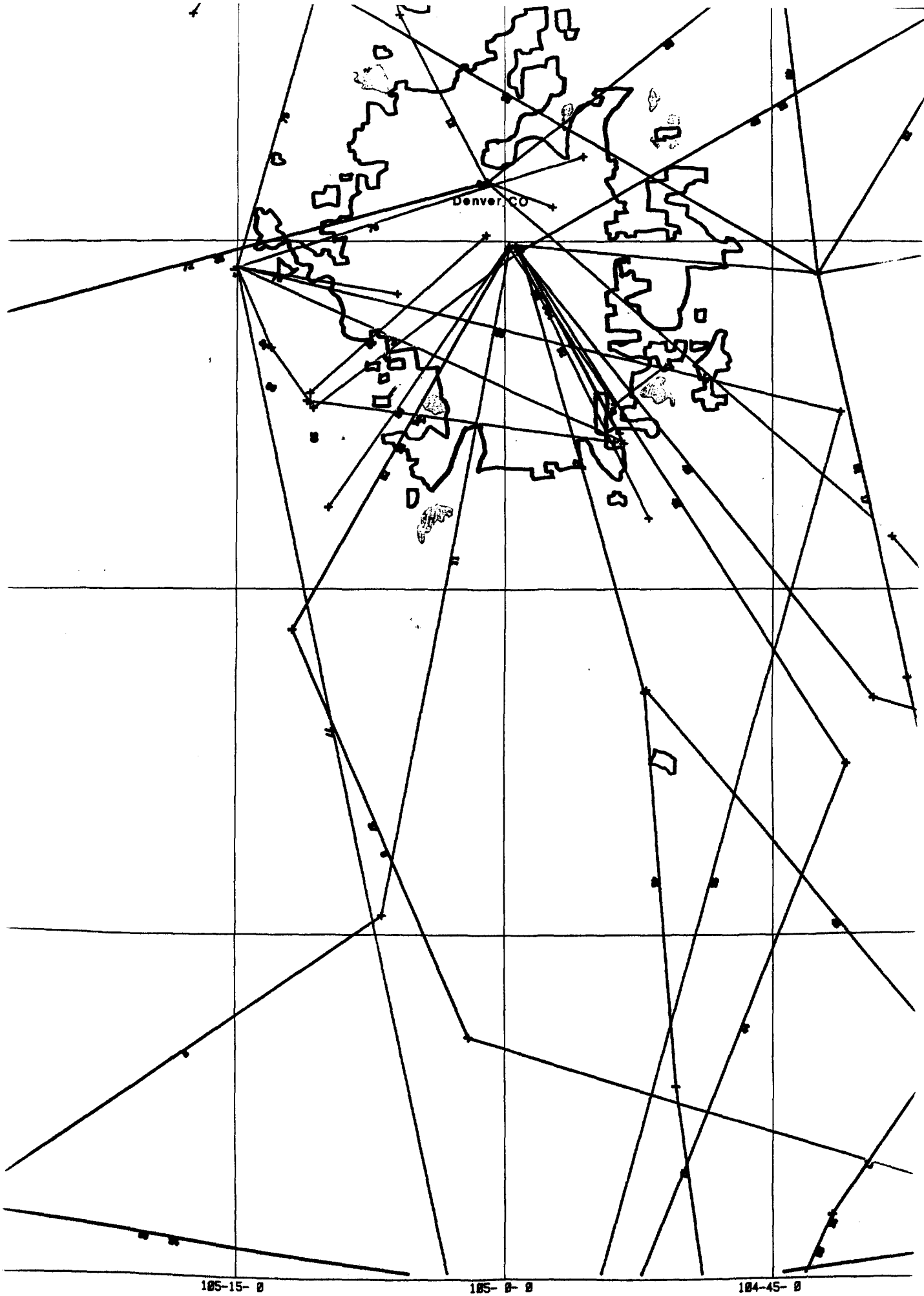
FREQUENCY OVERLAY
SEATTLE, WA

Note: For purposes of the RIPS system, attached is a 65% reduction of the Frequency Overlay map. The original map is on file.


SEATTLE, WA
Tacoma
- 0
122-30- 0
122-15- 0
122- 0- 0
SCALE 1: 250000
4, 6, AND 11 GHZ

FREQUENCY OVERLAY
DENVER, CO

Note: For purposes of the RIPS system, attached is a 65% reduction of the Frequency Overlay map. The original map is on file.

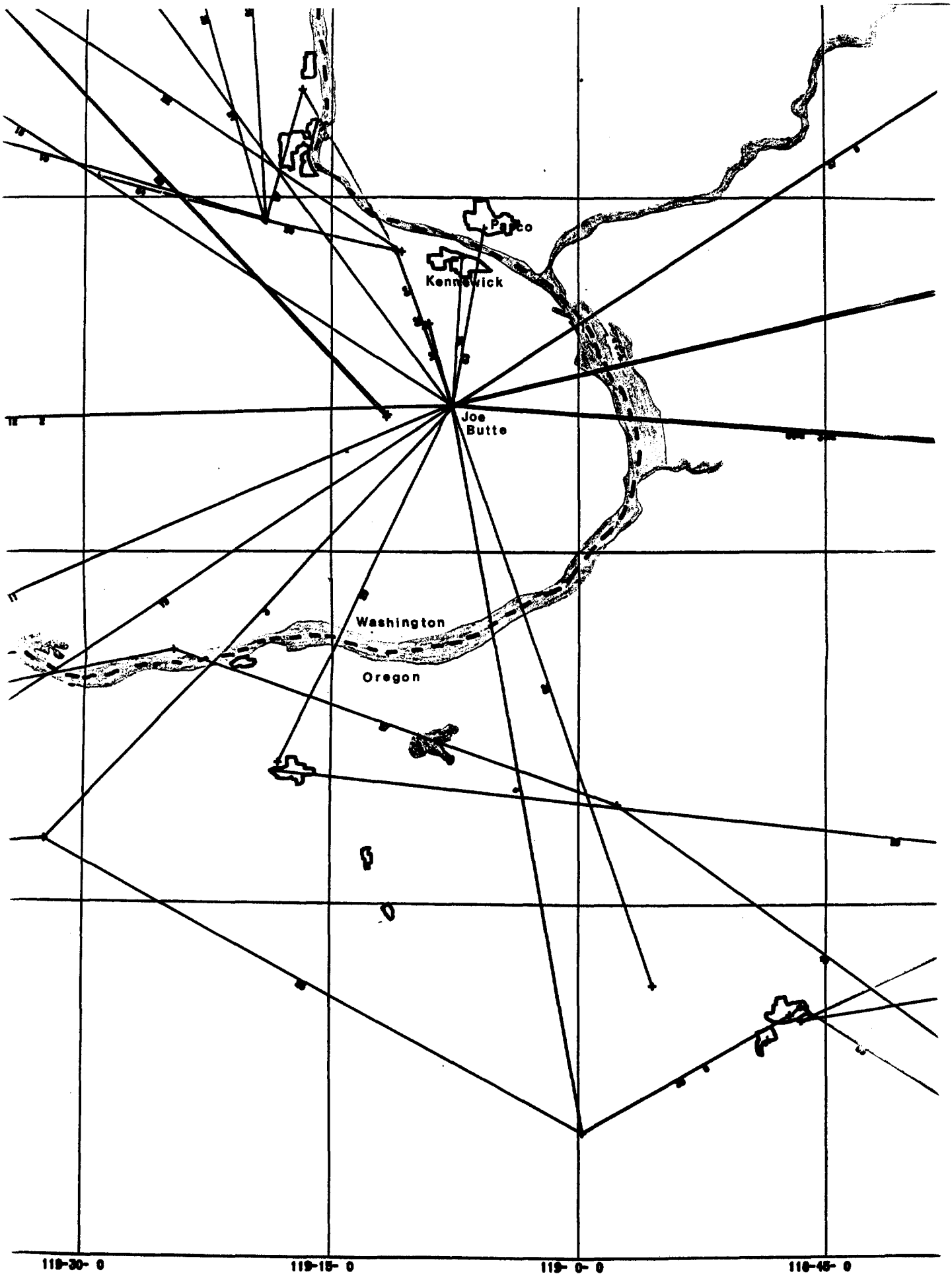


SCALE 1: 250000

4, 6, AND 11 GHZ
DENVER, CO

FREQUENCY OVERLAY
JUMP OFF JOE BUTTE, WA

Note: For purposes of the RIPS system, attached is a 65% reduction of the Frequency Overlay map. The original map is on file.



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4, 6, AND 11 GHZ
JOE BUTTE, WA
FREQUENCY OVERLAY
AS OF 2/5/93

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Attachment A

DOCUMENT OFF-LINE

This page has been substituted for one of the following:

o An oversize page or document (such as a map) which was too large to be scanned into the RIPS system.

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3 Maps = Frequency Overlay for Seattle, WA; Denver, CO; And Jumpoff Joe Butte, WA